WINONA LAKE

Kosciusko County

2007 Fish Management Report

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2008

EXECUTIVE SUMMARY

- Winona Lake is a 562-acre natural lake located on the southeast side of Warsaw in Kosciusko County, Indiana. The state-owned access at the Kiwanis Park at the northwest corner of the lake provides a handicap accessible boat ramp, dock, and parking.

- In 2007 a creel survey was completed in an attempt to gain more information on walleye and their use. A general lake survey during the summer and a fall evaluation of walleye were also conducted in 2007 to further evaluate the overall fishery and survival of stocked walleye.

- A roving-access creel survey was conducted from April 16 to October 26, 2007. During the creel survey anglers caught an estimated 11,538 fish. Angler harvest was greatest during the month of July, followed by September. Bluegill accounted for 82% of the total number of fish harvested followed by crappie and walleye, which accounted for 6% of the harvest each.

- A total of 638 walleyes (1.1 fish/acre) was harvested by anglers during the survey. Harvested walleyes ranged in length from 13.5 to 25.0 in and averaged 16.0 in. The greatest number of walleyes was harvested during the month of May, followed by June. Walleyes were harvested at a rate of 0.1 fish/h by those anglers targeting walleye.

- A general lake survey was completed on Winona Lake from July 9 to 10, 2007. During this survey, water chemistry data was also collected and an aquatic vegetation survey was conducted on August 6, 2007.

- Dissolved oxygen concentration was not adequate for fish survival below 18 ft on July 9. Submersed vegetation was present at a depth of 17 ft. Coontail and Eel grass dominated the plant community at the time of the vegetation survey.

- A total of 1,544 fish, representing 26 species, was collected during this survey. By number, bluegill ranked first, yellow perch ranked second, and gizzard shad ranked third in the sample. By weight, common carp ranked first followed by gizzard shad and walleye.

- Eighty-one walleyes weighing 87.6 lbs. were collected during the July survey. Length range was 7.5 to 23.6 in TL. PSD was 30 and RSD-P was 7. Fifty-one percent of the walleyes were legal size of 14 in TL or larger and the age-length key indicated most walleyes reached that size by age 3.

- Targeted walleye sampling was completed by pulsed D.C. electrofishing (EF) the shoreline at night with two dippers on September 25 (before stocking) and October 17 (after stocking). Sampling effort was 4.0 hr (2 hr each night).

- In the two nights of sampling, 75 walleyes were collected, 35 in September and 40 in October. Catch-per-unit-effort (CPUE) was 0.75/hr, 12/hr, and 4.25/hr for age-0 through age-2 respectively.

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INTRODUCTION

Winona Lake is a 562-acre natural lake located on the southeast side of Warsaw in Kosciusko County, Indiana. The state-owned access at the Kiwanis Park at the northwest corner of the lake provides a handicap accessible boat ramp, dock, and parking. Maximum depth is 72 ft and average depth is 30 ft. Previous fisheries surveys were conducted in 1970, 1976, 1982, 1994, and 2005. Largemouth bass and walleye population surveys were conducted in 2003 and 2004, in addition to a creel survey from April 2003 to May 2004 (Pearson 2006).

The Indiana DNR stocked walleye fry in 1986 and walleye fingerlings from 1987 to 1990 (Table 1). Stockings were discontinued due to poor survival of walleye. The fish population of Winona Lake has historically been dominated by small yellow perch, bluegill, logperch, and largemouth bass. Winona Lake has historically had problems not only with point source pollution from industries, but also with non-point source pollution in the form of nutrient runoff that contributes to the accelerated eutrophication of the lake (International Science and Technology 1991). The Winona Lake Preservation Association has actively pursued funding for dealing with both sedimentation and erosion problems and controlling the Eurasian watermilfoil in the lake through Lake and River Enhancement funds (LARE). From 2001 to 2007, Winona Lake was one of four study lakes used to evaluate whether stocking advanced fingerling walleye successfully creates a quality fishery (Burlingame 2006). Each year, walleyes were stocked at a rate of approximately 20/acre and averaged 6.8 in TL (Table 1).

An angler creel survey was conducted from April 16 through October 26, 2007 to measure angler use and harvest. A fisheries survey was conducted on July 9 and 10, 2007 to evaluate any changes in the general fish community since the previous fisheries survey in 2005, and to evaluate potential changes following the stocking of advanced fingerling walleye. Fall electrofishing has been conducted annually to evaluate walleye survival and growth of these stocked fish (Grier 2008).

METHODS

Creel Survey

A roving-access creel survey was conducted from April 16 to October 26, 2007. The survey was conducted using stratified random sampling in which 15 h workdays were split between 2 periods, each lasting 7.5 h. Each hour, the creel clerk counted shore and boat anglers

and conducted interviews. Each angler was asked about their fishing preference, number and species of fish harvested and caught and released, county of residence, whether they thought the fishery was improving, staying the same, or declining, and whether or not they support the walleye stocking program at Winona Lake. Random samples of harvested fish were also measured to the nearest 0.5 in. Our primary interest from this creel survey was to measure angler attitude and usage of stocked walleye.

General Survey

The Winona Lake general survey was conducted from July 9 to 10, 2007 as part of DFW Work Plan 204137. Some physical and chemical characteristics of the water were measured in the deepest area of the lake on July 9 using a Hydrolab Quanta® (Indiana Division of Fish and Wildlife 2001). Submersed aquatic vegetation was sampled on August 6, 2007 according to the Tier II Aquatic Vegetation Survey Protocol (IDNR 2007). A Garmin™ global positioning system device was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish collection sites.

Fish were collected by pulsed D.C. electrofishing (EF) the shoreline at night with two dippers at six, 15-minute stations (total EF time = 1.5 h). Six trap nets and eight experimental-mesh gill nets were fished overnight for a total of six trap-net lifts and eight gill-net lifts. All fish collected were measured to the nearest 0.1 in TL and weighed in the field to the nearest 0.01 lb.

Fish scale samples were taken from bluegill, yellow perch, largemouth bass, walleye, northern pike, and black crappie for age and growth analysis. Proportional stock density (PSD) and relative stock density (RSD) were calculated for bluegill, yellow perch, largemouth bass, walleye, black crappie, and white bass using electrofishing data only (Anderson and Neumann 1996). Additionally, an age-length key was created and mean length-at-age calculated for bluegill, yellow perch, walleye, largemouth bass, black crappie, and northern pike captured during this general survey (DeVries and Frie 1996).

Fall Walleye Sampling

Fish were collected by pulsed D.C. electrofishing (EF) the shoreline at night with two dippers on September 25 (before stocking) and October 17 (after stocking). Sampling effort was 4.0 hr (2 hr each night). Only walleye were collected. All walleye captured were measured to the nearest 0.1 in and weighed to the nearest 0.01 lb. Scale samples were taken for age and

growth analysis. Proportional stock density (PSD) and relative stock density (RSD) were calculated.

RESULTS

Creel Survey

During the creel survey conducted on Winona Lake anglers harvested an estimated 11,538 fish (Table 2). Angler harvest was greatest during the month of July, followed by September. Boat anglers accounted for 97% of the harvest and all anglers combined harvested 0.57 fish/h (Table 3). Bluegill accounted for 82% of the total number of fish harvested followed by crappie and walleye, which accounted for 6% of the harvest each (Table 2). During the survey period anglers fished for an estimated total of 20,254 h (36 h/acre) (Table 2). Boat anglers accounted for 98% of all angler effort (Table 4). The greatest amount of effort was documented during July, followed by June. Average complete trip length was 4.75 h for boat anglers and 1.81 h for shore anglers (Table 5).

An estimated 9,449 bluegills were harvested by anglers during the survey period (Table 2). They ranged in length from 5.0 to 10.0 in and averaged 7.5 in (Table 6). Of the bluegills harvested, 54% were equal to or greater than 8 in. The greatest number of bluegills was harvested during July, followed by September. Bluegills were harvested at a rate of 1.2 fish/h by those anglers targeting bluegill, with an overall harvest rate of 0.4 fish/h for all anglers combined.

Crappie ranked second by number with 727 being harvested by anglers (Table 2). They ranged in length from 7.0 to 14.5 in and averaged 10.0 in (Table 6). The greatest number of crappies was harvested during the month of May, followed by July. Crappies were harvested at a rate of 0.7 fish/h by those anglers targeting crappie, with an overall harvest rate of 0.03 fish/h for all anglers combined.

An estimated 638 walleyes (1.1 fish/acre) were harvested by anglers during the survey, ranking the species third in angler harvest (Table 2). Harvested walleyes ranged in length from 13.5 to 25.0 in and averaged 16.0 in (Table 6). The greatest number was harvested during the month of May, followed by June. Walleyes were harvested at a rate of 0.1 fish/h by those anglers targeting walleye. The overall harvest rate of walleye was 0.03 fish/h for all anglers combined. A total of 211 legal size walleyes were caught and released during the survey, with

an additional 1,375 released that were sub-legal size (Table 7). They were caught (harvest plus catch and release) at a rate of 0.4 fish/h by those anglers targeting walleye, with an overall catch rate of 0.1 fish/h for all anglers combined.

Other species harvested during the survey included yellow perch, northern pike, largemouth bass, redear sunfish, channel catfish, and miscellaneous sunfish. An estimated 199 yellow perch were harvested by anglers during the survey, ranking the species fourth in angler harvest (Table 2). Harvested perch ranged in length from 5.0 to 9.0 in and averaged 7.0 in (Table 6). A total of 143 northern pike was harvested by anglers and an additional 1,107 were released (Table 2). Harvested pike ranged in length from 20.0 to 30.5 in and averaged 25.0 in (Table 6). Harvested largemouth bass ranged in length from 14.0 to 19.0 in. A total of 1,542 legal size largemouth bass were caught and released during the survey, with an additional 2,572 released that were sub-legal size for an overall catch rate of 0.2 fish/h (Table 7).

Bluegill was targeted more by anglers than any other species during the survey, accounting for 35% of the responses (Table 8). Anglers claiming to be exclusively fishing for largemouth bass and walleye made up 32% and 16% of the responses, respectively. Anglers spent more time exclusively targeting largemouth bass than any other species, accounting for 35% of the total interview hours. Largemouth bass were targeted more than any other species during April, May, June, and August, while bluegill were targeted more during July, September, and October (Table 9).

Anglers from thirty three counties were represented during this survey (Table 10). The majority of anglers interviewed were from Kosciusko County, accounting for 49% of all anglers. Allen and Wabash counties accounted for 10% and 7% of the anglers, respectively. Anglers from other states accounted for 1% of the anglers.

During the interview process anglers were asked if the overall quality of fishing was improving, staying the same, or declining. Of the 633 anglers who responded 3% rated the fishing as improving, 94% as staying the same, and 3% as declining (Table 11). During the interview, anglers were also asked if they supported the walleye stocking program. All anglers responded positively.

General Survey

On July 9, dissolved oxygen concentration was not adequate for fish survival below 18 ft and Secchi depth was 3.6 ft. The thermocline was located between 12 and 26 ft.

The Secchi disk reading was 7.8 ft on August 6. Submersed vegetation was found to a maximum depth of 17 ft. In 90 sites sampled (80 littoral sites), coontail (48%) and water celery (32%) dominated the vegetation community. A total of eleven species was collected, including one exotic (Eurasian watermilfoil). Filamentous algae was present at 18% of the sampled sites.

A total of 1,544 fish, representing 26 species and one hybrid, was collected during this survey. Total weight of the fish sample was approximately 753 lbs. Species collected in past surveys, but not in this survey, include pumpkinseed, spotfin shiner, golden shiner, green sunfish, quillback, Johnny darter, shorthead redhorse, bowfin, fathead minnow, and white crappie (Table 12). By number, bluegill ranked first, yellow perch ranked second, and gizzard shad ranked third in the sample. By weight, carp ranked first followed by gizzard shad, walleye, and northern pike.

A total of 507 bluegills was collected that weighed 56.46 lbs. They ranged in length from 2.0 to 9.9 in TL. Relative abundance by number and weight were 33% and 8%, respectively. The electrofishing, gill net, and trap net catch rates were 196.0 fish/h, 3.6 fish/lift, and 30.7 fish/lift, respectively. The bluegill PSD was 22, which indicates a balanced population (Ney 1999). Bluegill growth appeared to be similar for all ages to that of bluegills captured in the 1994 and 2005 surveys. Mean length-at-age data from the age-length key indicated bluegill reach 6 in (i.e., quality size) at age 3.

A total of 456 yellow perch, weighing 9.55 lbs was captured during this survey. These fish ranged in size from 1.2 to 9.2 in TL. Yellow perch were captured by electrofishing, in gill nets, and in trap nets at rates of 298.0 fish/h, 0.8 fish/lift, and 0.5 fish/lift respectively. The yellow perch PSD was 4. Approximately 84% of the perch collected were age-1 and 3 to 5 in TL. Growth was unchanged since the 1994 survey. Yellow perch reach quality size of 8.0 inches at age-4.

Collections also yielded 99 gizzard shad that weighed approximately 91.74 lbs. They ranged in length from 2.1 to 17.2 in TL. Relative abundance by number and weight were 6% and 12%, respectively. The electrofishing, gill net, and trap net catch rates were 59.3 fish/h, 0.5 fish/lift, and 1.2 fish/lift, respectively. Sixty percent of the gizzard shad collected were adults larger then 11.0 in.

Eighty-one walleyes weighing 87.6 lbs. were collected during the July survey. Length range was 7.5 to 23.6 in TL. PSD was 30 and RSD-P was 7. Fifty-one percent of the walleyes

were legal size of 14 in TL or larger and the age-length key indicated most walleyes reached that size by age 3. CPUE was 28.7 fish/h and 4.8 fish/lift for electrofishing and gill-nets respectively. None were collected in trap-nets. Growth was slower for all age classes than in 2005.

Largemouth bass PSD was 53 and RSD-14 was 24, indicative of a quality largemouth bass fishery (Ney 1999). Average length data from back-calculation indicated bass reached 14 in (i.e., harvestable size) between age 4 and 5, the same as in 2005. Growth of largemouth bass in 2008 was faster for age-1 and age-2 but slower for older age classes than in 2005 but still faster growth than in 1994. In 1994, bass reached harvestable size between ages 5 and 6 (Braun 1994).

Black crappie, white bass, northern pike and carp were also captured during the general survey. Black crappie ranked sixth by number (N = 75), white bass ranked seventh (N = 34), and northern pike was eighth (N = 30). Black crappies ranged in TL from 4.4 to 12.0 in and in ages from 1 to 4. White bass ranged in TL from 6.2 to 17.4 in and in ages from 1 to 4. Thirty northern pike, ranging from 17.2 to 30.0 in TL, were captured. Ages 1 through 5 were represented. Eleven carp were captured, ranging in size from 13.7 to 32.2 in TL and weighing 104.05 lbs.

Fall Walleye Sampling

In the two nights of sampling, 75 walleyes were collected, 35 in September and 40 in October. Only three age-0 fish were collected, two the first night and one the second night. No age-3 walleye were collected either night. Length range was 8.0 to 25.5 in TL. PSD for the fall sample was 33 and RSD-P was 3. Catch-per-unit-effort (CPUE) was 0.8 fish/h, 12.0 fish/h, and 4.3 fish/h for age-0 through age-2 respectively. CPUE for age-3 and older walleyes was 1.8 fish/h.

DISCUSSION

Bluegill continue to dominate the fishery at Winona Lake as first observed during the 2005 survey. Prior to 2005, yellow perch were typically the most abundant species, far outnumbering bluegill. However it appears the perch population has rebounded as a result of a strong 2006 year class. Northern pike appear to have increased in abundance since the last survey as well, and are more abundant than during prior surveys. A variety of factors can effect recruitment including predator stockings. However, at this point it remains unclear what impacts, if any, walleye stockings have had on the fish community.

The walleye fishery at Winona Lake continues to provide good angling opportunities. The population contains harvestable size fish, with individuals greater than 25 inches present. Angler harvest was greater than the Division of Fish and Wildlife criteria for success of greater than or equal to one walleye harvested per acre. In addition the catch per hour by targeted walleye anglers was greater than the success criteria of 0.1 fish/h. Walleye stockings continue to be successful with some year to year variation, and growth rates continue to be comparable to the natural lakes average (Burlingame 2006). While the majority of anglers who fish at Winona prefer bluegill and largemouth bass, there is continued interest and support in the walleye fishery. The present economic value of walleye trips based on results of this creel survey and the US Fish and Wildlife standard of $64 per fishing trip in Indiana, was greater than $20,000. A more detailed analysis of the walleye population at Winona Lake and an overview of the survival of advanced walleye fingerlings in Indiana natural lakes are scheduled to be completed in 2009.

RECOMMENDATIONS

- The DFW should maintain the 14-inch minimum size limit on largemouth bass and walleye at Winona Lake.
- The DFW should continue to monitor the walleye population at Winona Lake.
- The DFW should continue to stock advanced fingerling walleye at the rate of 15 fish/acre.

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Submitted by: Edward R. Braun, Biologist and Rod Edgell, Assistant Biologist
Date: 6/24/2009

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Date: 8/5/2009

Table 1. Date, number, and average length of walleyes stocked at Winona Lake from 1986 through 2007.

Date Stocked	Number	Average Length
May 1986	1,680,000	0.4
June 1987	51,906	1.9
June 1988	56,734	1.8
June 1989	58,850	1.5
June 1990	58,324	1.2
September 2001	10,740	6.6
October 2002	11,240	6.3
October 2003	11,300	7.5
October 2004	11,240	6.4
October 2005	11,240	7.3
October 2006	11,240	7.0
October 2007	11,240	NA

Table 2. Monthly angler harvest by species and angler effort at Winona Lake during 2007.

Species	April	May	June	July	August	September	October	Total
Bluegill	119	760	1,147	2,552	1,062	2,502	1,307	9,449
Crappie	110	206	22	205	65	74	45	727
Walleye	52	127	123	104	67	52	113	638
Yellow perch	0	16	47	90	12	19	15	199
Northern pike	7	28	34	20	39	4	11	143
Largemouth bass	15	59	29	17	9	3	8	140
Redear sunfish	35	26	26	4	3	3	0	97
White bass	3	51	31	0	0	0	0	85
Warmouth	0	0	18	4	3	0	0	25
Channel catfish	4	3	4	4	4	0	0	19
Other	0	0	0	6	6	0	4	16
Total	345	1,276	1,481	3,006	1,270	2,657	1,503	11,538
Angler Hours	1097	3136	4188	4278	2827	2520	2208	20,254
Shore Hours	39	76	56	41	86	0	147	445
Boat Hours	1,058	3,060	4,132	4,238	2,741	2,520	2,061	19,809

Table 3. Total harvest by boat and shore anglers at Winona Lake during 2007.

Species	Boat	Shore
Bluegill	9,152	297
Crappie	704	23
Walleye	627	11
Yellow perch	192	7
Northern pike	143	0
Largemouth bass	137	3
Redear sunfish	91	6
White bass	82	3
Warmouth	25	0
Channel catfish	19	0
Other	16	0
Total	11,188	350

Table 4. Monthly angler hours by fishing method and day type at Winona Lake during 2007.

	Boat Effort		Shore Effort		Total Effort	
Month	WD	WE	WD	WE	WD	WE
April	412.50	645.00	16.50	22.50	429.00	667.50
May	1,339.04	1,721.25	50.77	25.31	1,389.81	1,746.56
June	1,378.13	2,754.00	15.75	40.50	1,393.88	2,794.50
July	1,990.23	2,247.75	0.00	40.50	1,990.23	2,288.25
August	2,035.50	705.00	86.25	0.00	2,121.75	705.00
September	1,222.50	1,297.50	0.00	0.00	1,222.50	1,297.50
October	966.00	1,095.00	146.63	0.00	1,112.63	1,095.00
Total	9,343.89	10,465.50	315.89	128.81	9,659.78	10,594.31
Grand Total	19,809.39		444.71		20,254.10	

WD=Weekday, WE=Weekend

Table 5. Distribution of party and angler numbers as well as the average amount of time for each fish trip by month at Winona Lake during 2007.

	April	May	June	July	August	September	October	Total
Weekday Parties	17	71	60	61	78	47	41	375
Weekend Parties	26	58	75	70	34	53	35	351
Shore Parties	5	10	4	2	7	2	3	33
Boat Parties	38	119	131	129	105	98	73	693
Total Parties	43	129	135	131	112	100	76	726
Weekday Anglers	30	120	106	114	131	77	68	646
Weekend Anglers	51	105	144	144	74	93	65	676
Shore Anglers	6	11	10	5	9	2	6	49
Boat Anglers	75	214	240	253	196	168	127	1273
Total Anglers	81	225	250	258	205	170	133	1322
Weekday Average Trip	3.28	4.33	3.46	4.44	3.58	4.03	3.86	3.89
Weekend Average Trip	3.91	5.20	6.07	5.11	6.82	5.22	4.30	5.45
Shore Average Trip	1.75	2.02	1.00	2.50	1.86	0.88	3.50	1.81
Boat Average Trip	3.92	4.95	5.01	4.82	4.76	4.78	4.01	4.75
Total Average Trip	3.60	4.72	4.87	4.77	4.57	4.68	4.00	4.60

Table 6. Length frequency and mean length of fish species harvested from Winona lake during 2007.

Inches	Bluegill	Crappie	Redear sunfish	Northern pike	Yellow perch	Largemouth bass	Walleye	White bass
5.0	2				3			
5.5	4				4			
6.0	62		3		12			
6.5	138		11		5			
7.0	366	1	9		16			
7.5	608	7	4		4			
8.0	673	11	2		9			
8.5	513	24			4			
9.0	171	33			3			
9.5	31	16						
10.0	1	30						
10.5		22	2					
11.0		20						
11.5		12						
12.0		16						2
12.5		8						4
13.0		3						3
13.5		2					3	3
14.0						4	19	6
14.5		1				6	25	1
15.0						10	40	4
15.5						4	16	
16.0						4	13	1
16.5						5	9	3
17.0						3	19	1
17.5						1	8	
18.0						4	7	
18.5							5	
19.0						1	4	
19.5								
20.0				2			7	
20.5				1			1	
21.0				3			2	
21.5				1			2	
22.0				5			1	
22.5								
23.0				3			1	
23.5								
24.0				6			1	
24.5				1				
25.0				6			1	
25.5				3				
26.0				1				
26.5				1				
27.0				1				
27.5				1				
28.0				1				
28.5				2				
29.0				1				
29.5				2				
30.0								
30.5				1				
Total	2,569	206	31	42	60	42	184	28
Mean Length	7.5	10.0	7.0	25.0	7.0	15.5	16.0	14.0

Table 7. Monthly angler catch and release of walleyes and largemouth bass based on a 14-inch minimum size limit at Winona Lake during 2007.

Species	April	May	June	July	August	September	October	Total
Legal walleye	21	61	89	20	15	5	0	211
sub-legal walleye	15	405	508	66	83	65	233	1,375
Total	36	466	597	86	98	70	233	1,586
Legal largemouth bass	93	284	527	292	238	70	38	1,542
sub-legal largemouth bass	124	558	545	626	423	128	168	2,572
Total	217	842	1,072	918	661	198	206	4,114

Table 8. Number of anglers, interview hours, harvest, and catch and release by preference at Winona Lake during 2007.

			Harvest									Released	
Fishing preference	Anglers	Hours	Largemouth bass	Bluegill	Walleye	Pike	Crappie	White bass	Redear	Channel catfish	Yellow perch	Walleye	Largemouth bass
Bluegill	464	1,928.78	2	2,382	19	5	24		30	2	53	54	41
Largemouth bass	425	2,135.48	8	23	7	1	1					46	1,068
Walleye	206	1,036.52	9	61	126	5	55	1		2	2	333	81
Bluegill/Largemouth bass	32	106.58	12	82			1	17				1	25
Largemouth bass/Walleye	30	120.10	3	7	3	1						8	13
Crappie/Walleye	25	124.72	1		11	4	26			1		2	3
Northern pike	24	106.15	2		2	10						1	5
Crappie	24	104.73	1	9	1	1	72					1	2
Other	21	3,734.28		3		4	5	1			5	4	1
Bluegill/Walleye	20	107.27		78	4		1					15	4
Walleye/Northern pike	17	60.43			5	5	2	1				6	1
Largemouth bass/Northern pike	14	64.65	4		3	6							5
Bluegill/Crappie	12	52.70		42	2		19					1	2
White bass	8	17.10						8					

Table 9. Monthly angler preference at Winona Lake during 2007.

Species	April	May	June	July	August	September	October	Total
Bluegill	16	55	69	98	73	101	52	464
Largemouth bass	26	74	99	95	76	30	25	425
Walleye	13	57	47	24	19	18	28	206
Bluegill/Largemouth bass	4	4	11	5	1	3	4	32
Largemouth bass/Walleye	2		3	13	5		7	30
Crappie/Walleye	10	9	2	3			1	25
Northern pike				4	17	3		24
Crappie	5	14		1		4		24
Other	2		7	3	5	2	2	21
Bluegill/Walleye		2		6	2		10	20
Walleye/Northern pike		6	4		3		4	17
Largemouth bass/Northern pike	2	2	3	5		2		14
Bluegill/Crappie	1	2	1		4	4		12
White bass			4	1		3		8
Total	81	225	250	258	205	170	133	1,322

Table 10. Residency of angling parties fishing at Winona Lake during 2007.

County	Code	# of Interviews	Percentage
Kosciusko	43	353	48.6
Allen	2	73	10.1
Wabash	85	54	7.4
Whitley	92	44	6.1
Elkhart	20	30	4.1
Marshall	50	27	3.7
Miami	52	23	3.2
Lake	45	22	3.0
Dubois	25	14	1.9
St. Joseph	71	10	1.4
Porter	64	9	1.2
Noble	57	8	1.1
Grant	27	7	1.0
Huntington	35	7	1.0
Howard	34	6	0.8
LaPorte	46	5	0.7
Pulaski	66	4	0.6
Adams	1	2	0.3
Blackford	5	2	0.3
Carroll	8	2	0.3
Henry	33	2	0.3
Jasper	37	2	0.3
Monroe	53	2	0.3
Dekalb	17	1	0.1
Delaware	18	1	0.1
Fayette	21	1	0.1
Hamilton	29	1	0.1
Hendricks	32	1	0.1
Madison	48	1	0.1
Scott	72	1	0.1
Starke	75	1	0.1
Tipton	80	1	0.1
Wayne	89	1	0.1
Other States		8	1.1
Total		726	

Table 11. Angler response by preference when asked if the overall quality of fishing was improving, staying the same, or declining at Winona Lake during 2007.

Species	Improving	Same	Declining	# of responses
Bluegill	6	231	6	243
Largemouth bass	5	227	10	242
Walleye	6	107	2	115
Crappie	0	14	0	14
Northern pike	0	11	0	11
White bass	0	5	0	5
Yellow perch	0	2	0	2
Channel catfish	0	1	0	1
Total	17	598	18	633
Percent	2.7	94.5	2.8	

Table 12. Fish species and number of individuals captured in Winona Lake general surveys from 1976 through 2007. The letter 'P' denotes presence.

Species	1976	1982	1995	2005	2007
Bluegill	208	85	266	490	507
Walleye			14	68	73
Largemouth bass	64	23	192	45	79
White sucker	42	41	38	31	18
Gizzard shad	374	21	74	21	100
Northern pike	5	5	8	19	30
Redear sunfish	4	1	7	17	13
Yellow perch	318	698	860	16	456
Yellow bullhead	4	4	9	15	16
Spotted sucker	48	37	29	14	12
Golden redhorse		1	1	13	16
White bass	27	20	17	10	33
Rock bass	10	8	25	10	1
Longnose gar	11	4	12	10	14
Spotted gar	1	7	16	9	20
Pumpkinseed	12		7	7	
Black crappie	6	55	67	6	75
Carp	17	22	3	6	11
Channel catfish	51	62	18	6	6
Brown bullhead	5	30	10	4	11
Warmouth	6	3	8	3	3
Longear sunfish	74		4	2	6
Logperch	14	P	195	2	11
Spotfin shiner	10		2	1	
Golden shiner	1	1		1	
Green sunfish	2	1	1	1	
Quillback	6		4	1	
Brook silverside	P	P	31		15
Bluntnose minnow	1		7		2
Johnny darter		P	2		
Shorthead redhorse			2		
Bowfin		1	1		
Black bullhead	1	8			4
Fathead minnow		P			
Lake chubsucker	3				2
Hybrid sunfish					2
White crappie	1				
Total	1322	1138	1930	828	1461
Electrofishing Effort (h)	3.5*	1	1.5	1.5	1.5
# of Gill Net Lifts	16	12	9	8	8
# of Trap Net Lifts	0	9	9	6	6

* AC Electrofishing, 1.5 h day and 2.0 h night

APPENDIX

Lake Pages

LAKE SURVEY REPORT

Type of Survey: [ ] Initial Survey [x] Re-Survey

Lake Name	County	Date of survey (Month, day, year)
Winona	Kosciusko	7/9/2007
Biologist's name		Date of survey (Month, day, year)
Edward Braun		7/10/2007

LOCATION

Quadrangle Name	Range	Section
Warsaw	6E	15, 16, 17, 21, 22
Township Name	Nearest Town	
32N	Warsaw	

ACCESSIBILITY

State owned public access site	Privately owned public access site	Other access site
Kiwanis Park at Smith St. and Country Club Rd.	Winona Marina - north end of lake	

Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations
562	72ft	30	16,860	811 ft	none

Location of benchmark

INLETS

Name	Location	Origin
Peterson Ditch	South end of lake	T31N:R7E:S29
Wyland Ditch	SE corner	Tennant Lake
Keeper-Evans Ditch	South end of lake	T31N:R6E:S6

OUTLETS

Name	Location
Eagle Creek	NE end of lake

Water level control: Concrete dam with 2, 3x4 adjustable gates

POOL	ELEVATION (Feet MSL)	ACRES
TOP OF DAM		
TOP OF FLOOD CONTROL POOL		
TOP OF CONSERVATION POOL		
TOP OF MINIMUM POOL		
STREAMBED		

Bottom type

[ ]	Boulder
[X]	Gravel
[X]	Sand
[X]	Muck
[X]	Clay
[ ]	Marl

Watershed use: Agricultural row crops, woodlots, and some municipal drainage

Development of shoreline: 95% residential and municipal

Previous surveys and investigations

General surveys: 1970, 1976, 1982, 1994, and 2005

SAMPLING EFFORT					
ELECTROFISHING	Day hours: 0		Night hours: 1.5		Total hours: 1.5
TRAP NETS	Number of traps: 6		Number of Lifts: 1		Total effort: 6
GILL NETS	Number of nets: 8		Number of Lifts: 1		Total effort: 8
ROTENONE	Gallons:	ppm:	Acre Feet Treated:	SHORELINE SEINING	Number of 100 Foot Seine Hauls:

PHYSICAL AND CHEMICAL CHARACTERISTICS		
Color: Green	Turbidity: 3 Feet 6 Inches (SECCHI DISK)	Air temperature: 90º F
Water chemistry GPS coordinates: N W		

WATER QUALITY PARAMETERS															
DEPTH (Feet)	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.	DEPTH	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.
SURFACE	79.9	7.52	0.489	8.24	0.3	96.6	54.2	52	44	0	0.567	7.19	0.4	0	16
2	79.8	7.43	0.489	8.23	0.3	95.5	51.9	54	44	0	0.568	7.19	0.4	0	15.6
4	79.7	7.52	0.489	8.22	0.3	96.4	49.8	56	44	0	0.569	7.18	0.4	0	15.4
6	79.6	7.31	0.489	8.18	0.3	93.8	48.6	58	43.9	0	0.569	7.2	0.4	0	15.5
8	79.5	7.18	0.49	8.15	0.3	92	47.3	60	43.9	0	0.571	7.19	0.4	0	15.6
10	78.6	6.26	0.498	8	0.3	79.5	44.1	62	43.8	0	0.569	7.19	0.4	0	15.8
12	76.7	5.28	0.504	7.85	0.3	65.7	39.1	64	43.8	0	0.57	7.21	0.4	0	15.3
13.9	73.7	1.97	0.524	7.44	0.3	23.7	35.3	66	43.8	0	0.571	7.21	0.4	0	16
16	70.5	0.7	0.537	7.36	0.3	8.2	41.9	68	43.8	0	0.571	7.2	0.4	0	17.6
18	65.7	0.32	0.553	7.32	0.4	3.6	48.4	70	43.7	0	0.572	7.2	0.4	0	15.4
20	60.1	0.05	0.56	7.29	0.4	0.5	49.6	72	43.6	0	0.574	7.18	0.4	0	15.5
22	54.7	0	0.562	7.22	0.4	0	49.8	74	43.7	0	0.573	7.19	0.4	0	17.3
23.8	51.4	0	0.564	7.19	0.4	0	44.9	75.9	43.6	0	0.611	6.81	0.4	0	5999
26	50.3	0	0.565	7.18	0.4	0	36.8	78							
28	48.7	0	0.565	7.17	0.4	0	34.6	80							
30	47.7	0	0.564	7.16	0.4	0	32.2	82							
32.1	47.1	0	0.564	7.16	0.4	0	30.7	84							
33	46.9	0	0.565	7.17	0.4	0	27.9	86							
36	46.1	0	0.565	7.19	0.4	0	25.4	88							
38	45.5	0	0.565	7.17	0.4	0	24.1	90							
40	45.1	0	0.566	7.19	0.4	0	22	92							
41.9	44.8	0	0.566	7.18	0.4	0	20.4	94							
44	44.6	0	0.565	7.19	0.4	0	18.9	96							
46	44.4	0	0.565	7.21	0.4	0	16.4	98							
48	44.3	0	0.565	7.19	0.4	0	15.8	100							
50	44.2	0	0.566	7.18	0.4	0	15.9								

Occurrence and abundance of submersed aquatic plants in Winona Lake

County:	Kosciusko	Sites with plants:	64	Mean species/site:	1.4
Date:	8/6/2007	Sites with native plants:	64	Standard error (ms/s):	0.13
Secchi (ft):	7.8	Number of species:	11	Mean native species/site:	1.3
Maximum plant depth (ft):	17	Number of native species:	10	Standard error (mns/s):	0.13
Trophic status		Maximum species/site:	4	Species diversity:	0.79
Total sites:	90			Native species diversity:	0.78

All depths (0 to 20 ft)	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
Coontail	47.8	52.2	32.2	12.2	3.3	17.1
Wild Celery	32.2	67.8	17.8	7.8	6.7	14.9
Chara	16.7	83.3	13.3	3.3	0.0	4.7
Slender Naiad	14.4	85.6	12.2	1.1	1.1	4.2
Flat-stemmed Pondweed	7.8	92.2	4.4	2.2	1.1	3.3
Northern naiad	7.8	92.2	7.8	0.0	0.0	1.6
Sago Pondweed	4.4	95.6	3.3	1.1	0.0	1.3
Small Pondweed	2.2	97.8	2.2	0.0	0.0	0.4
American Pondweed	1.1	98.9	1.1	0.0	0.0	0.2
Eurasian Watermilfoil	1.1	98.9	1.1	0.0	0.0	0.2
Northern Watermilfoil	1.1	98.9	1.1	0.0	0.0	0.2

Depth: 0 to 5 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
Wild Celery	62.1	37.9	34.5	17.2	10.3	27.6
Coontail	48.3	51.7	44.8	3.4	0.0	11.0
Chara	37.9	62.1	27.6	10.3	0.0	11.7
Slender Naiad	31.0	69.0	24.1	3.4	3.4	10.3
Flat-stemmed Pondweed	17.2	82.8	6.9	6.9	3.4	9.0
Sago Pondweed	13.8	86.2	10.3	3.4	0.0	4.1
Northern naiad	10.3	89.7	10.3	0.0	0.0	2.1
Small Pondweed	3.4	96.6	3.4	0.0	0.0	0.7
American Pondweed	3.4	96.6	3.4	0.0	0.0	0.7
Northern Watermilfoil	3.4	96.6	3.4	0.0	0.0	0.7

Depth: 5 to 10 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
Coontail	55.6	44.4	25.9	22.2	7.4	25.9
Wild Celery	40.7	59.3	22.2	7.4	11.1	20.0
Chara	14.8	85.2	14.8	0.0	0.0	3.0
Slender Naiad	7.4	92.6	7.4	0.0	0.0	1.5
Flat-stemmed Pondweed	7.4	92.6	7.4	0.0	0.0	1.5
Northern naiad	7.4	92.6	7.4	0.0	0.0	1.5
Small Pondweed	3.7	96.3	3.7	0.0	0.0	0.7
Eurasian Watermilfoil	3.7	96.3	3.7	0.0	0.0	0.7

Depth: 10 to 15 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
Coontail	54.2	45.8	33.3	16.7	4.2	20.8
Slender Naiad	8.3	91.7	8.3	0.0	0.0	1.7
Northern naiad	8.3	91.7	8.3	0.0	0.0	1.7

Depth: 15 to 20 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
Coontail	10.0	90.0	10.0	0.0	0.0	2.0

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Bluegill	507	32.8	2.0-9.9	56.46	7.5
Yellow Perch	456	29.5	1.2-9.2	9.55	1.3
Gizzard Shad	99	6.4	2.1-17.2	91.74	12.2
Walleye	81	5.2	7.5-23.6	87.60	11.6
Largemouth Bass	79	5.1	2.3-19.3	49.50	6.6
Black Crappie	75	4.9	4.4-12.0	45.98	6.1
White Bass	34	2.2	6.2-17.4	35.85	4.8
Northern Pike	30	1.9	17.2-30.0	77.04	10.2
Spotted Gar	20	1.3	16.7-27.8	31.30	4.2
White Sucker	18	1.2	5.1-19.6	35.25	4.7
Yellow Bullhead	16	1.0	6.9-14.3	12.19	1.6
Golden Redhorse	16	1.0	13.2-18.2	20.48	2.7
Brook Silverside	15	1.0	1.7-4.1	0.07	0.0
Longnose Gar	14	0.9	21.3-36.0	25.71	3.4
Redear Sunfish	13	0.8	3.0-6.7	1.31	0.2
Spotted Sucker	12	0.8	8.3-18.2	21.92	2.9
Common Carp	11	0.7	13.7-32.2	104.05	13.8
Brown Bullhead	11	0.7	8.2-14.7	11.70	1.6
Log Perch	11	0.7	2.0-4.0	0.12	0.0
Longear Sunfish	6	0.4	3.6-5.4	0.07	0.0
Channel Catfish	6	0.4	20.2-25.9	33.17	4.4
Black Bullhead	4	0.3	2.8-4.6	0.08	0.0
Warmouth	3	0.2	7.0-8.6	0.22	0.0
Lake Chubsucker	2	0.1	6-6.3	0.25	0.0
Bluntnose Minnow	2	0.1	3.1-3.6	0.01	0.0
Hybrid Bluegill	2	0.1	7.8-8.0	1.03	0.1
Rock Bass	1	0.1	7.5	0.28	0.0
Total (26 Species and 1 Hybrid)	1544	100.0		752.93	100.0

*Common names of fishes recognized by the American Fisheries Society.

					TN	GN	EF
Lake:	Winona						
Date:	7/9/2007	to	7/10/2007	Total #	184	29	294
Species:	Bluegill			Effort	6	8	1.5
Total number:	507			CPUE	31	4	196
Total weight:	56.46						
Length range:	2.0	to	9.9				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	3	122	29	287	438	-
Quality	6	34	27	64	125	22
Preferred	8	10	14	7	31	2
Memorable	10	0	0	0	0	
Trophy	12	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0	14	0.01	18.5			35.0		
2.5	55	0.00	19.0			35.5		
3.0	45	0.01	19.5			36.0		
3.5	13	0.03	20.0			36.5		
4.0	48	0.05	20.5			37.0		
4.5	96	0.06	21.0			37.5		
5.0	71	0.09	21.5			38.0		
5.5	40	0.13	22.0			38.5		
6.0	23	0.17	22.5			39.0		
6.5	27	0.20	23.0			39.5		
7.0	26	0.28	23.5			40.0		
7.5	18	0.25	24.0			40.5		
8.0	12	0.40	24.5			41.0		
8.5	9	0.48	25.0			41.5		
9.0	8	0.56	25.5			42.0		
9.5	2	0.38	26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

					TN	GN	EF
Lake:	Winona						
Date:	7/9/2007	to	7/10/2007	Total #	3	6	447
Species:	Yellow perch			Effort	6	8	1.5
Total number:	456			CPUE	1	1	298
Total weight:	9.55						
Length range:	1.2	to	9.2				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	5	3	6	47	56	-
Quality	8	1	1	2	4	4
Preferred	10	0	0	0	0	
Memorable	12	0	0	0	0	
Trophy	15	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0	1	0.00	17.5			34.0		
1.5	10	0.00	18.0			34.5		
2.0	2	0.00	18.5			35.0		
2.5	3	0.00	19.0			35.5		
3.0	125	0.01	19.5			36.0		
3.5	197	0.01	20.0			36.5		
4.0	50	0.01	20.5			37.0		
4.5	12	0.03	21.0			37.5		
5.0	9	0.06	21.5			38.0		
5.5	7	0.06	22.0			38.5		
6.0	13	0.08	22.5			39.0		
6.5	11	0.09	23.0			39.5		
7.0	6	0.15	23.5			40.0		
7.5	6	0.16	24.0			40.5		
8.0	3	0.20	24.5			41.0		
8.5			25.0			41.5		
9.0	1	0.28	25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

					TN	GN	EF
Lake:	Winona						
Date:	7/9/2007	to	7/10/2007	Total #	7	4	88
Species:	Gizzard shad			Effort	6	8	1.5
Total number:	99			CPUE	1	1	59
Total weight:	91.74						
Length range:	2.1	to	17.2				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock						
Quality						
Preferred						
Memorable						
Trophy						

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0	4	0.00	18.5			35.0		
2.5	6	0.00	19.0			35.5		
3.0	8	0.00	19.5			36.0		
3.5			20.0			36.5		
4.0			20.5			37.0		
4.5			21.0			37.5		
5.0			21.5			38.0		
5.5			22.0			38.5		
6.0			22.5			39.0		
6.5			23.0			39.5		
7.0			23.5			40.0		
7.5	1	0.20	24.0			40.5		
8.0	6	0.21	24.5			41.0		
8.5	9	0.27	25.0			41.5		
9.0	5	0.30	25.5			42.0		
9.5	1	0.31	26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5	1	0.60	28.0			44.5		
12.0	1	0.73	28.5			45.0		
12.5	5	0.80	29.0			45.5		
13.0	1	0.83	29.5			46.0		
13.5	3	0.99	30.0			46.5		
14.0	6	1.23	30.5			47.0		
14.5	11	1.47	31.0			47.5		
15.0	14	1.58	31.5			48.0		
15.5	12	1.73	32.0			48.5		
16.0	1	2.34	32.5			49.0		
16.5	2	2.04	33.0			49.5		
17.0	2	2.02	33.5			50.0		

					TN	GN	EF
Lake:	Winona			Total #	0	38	43
Date:	7/9/2007	to	7/10/2007	Effort	6	8	1.5
Species:	Walleye			CPUE	0	5	29
Total number:	81						
Total weight:	87.6						
Length range:	7.5	to	23.6				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	10	0	36	27	63	-
Quality	15	0	24	8	32	30
Preferred	20	0	3	2	5	7
Memorable	25	0	0	0	0	
Trophy	30	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5	2	0.98	34.0		
1.5			18.0	3	1.96	34.5		
2.0			18.5	4	2.35	35.0		
2.5			19.0	3	2.48	35.5		
3.0			19.5	1	2.67	36.0		
3.5			20.0	3	2.82	36.5		
4.0			20.5			37.0		
4.5			21.0			37.5		
5.0			21.5			38.0		
5.5			22.0			38.5		
6.0			22.5	1	3.98	39.0		
6.5			23.0			39.5		
7.0			23.5	1	4.70	40.0		
7.5	1	0.12	24.0			40.5		
8.0	3	0.17	24.5			41.0		
8.5	3	0.20	25.0			41.5		
9.0	6	0.26	25.5			42.0		
9.5	5	0.28	26.0			42.5		
10.0	10	0.32	26.5			43.0		
10.5	1	0.36	27.0			43.5		
11.0	2	0.42	27.5			44.0		
11.5	1	0.45	28.0			44.5		
12.0			28.5			45.0		
12.5	1	0.62	29.0			45.5		
13.0	2	0.75	29.5			46.0		
13.5	5	0.69	30.0			46.5		
14.0	3	0.98	30.5			47.0		
14.5	6	1.09	31.0			47.5		
15.0	4	1.18	31.5			48.0		
15.5	5	1.30	32.0			48.5		
16.0	3	1.47	32.5			49.0		
16.5			33.0			49.5		
17.0	2	1.72	33.5			50.0		

					TN	GN	EF
Lake:	Winona Lake			Total #	0	0	75
Date:	9/25/2007	to	10/17/2007	Effort	0	0	4
Species:	Walleye			CPUE	0	0	19
Total number:	75						
Total weight:	71.45						
Length range:	8.0	to	25.5				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	10	0	0	72	72	-
Quality	15	0	0	24	24	33
Preferred	20	0	0	2	2	3
Memorable	25	0	0	1	1	1
Trophy	30	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5	2	1.93	34.0		
1.5			18.0			34.5		
2.0			18.5	1	2.27	35.0		
2.5			19.0			35.5		
3.0			19.5	1	2.46	36.0		
3.5			20.0			36.5		
4.0			20.5	1	2.96	37.0		
4.5			21.0			37.5		
5.0			21.5			38.0		
5.5			22.0			38.5		
6.0			22.5			39.0		
6.5			23.0			39.5		
7.0			23.5			40.0		
7.5			24.0			40.5		
8.0	1	0.15	24.5			41.0		
8.5			25.0			41.5		
9.0	1	0.24	25.5	1	5.33	42.0		
9.5	1	0.29	26.0			42.5		
10.0	3	0.36	26.5			43.0		
10.5	4	0.38	27.0			43.5		
11.0	5	0.47	27.5			44.0		
11.5	6	0.51	28.0			44.5		
12.0	7	0.58	28.5			45.0		
12.5	9	0.65	29.0			45.5		
13.0	9	0.72	29.5			46.0		
13.5	4	0.78	30.0			46.5		
14.0			30.5			47.0		
14.5	1	1.18	31.0			47.5		
15.0	1	1.08	31.5			48.0		
15.5	2	1.24	32.0			48.5		
16.0	7	1.37	32.5			49.0		
16.5	6	1.45	33.0			49.5		
17.0	2	1.73	33.5			50.0		

					TN	GN	EF
Lake:	Winona			Total #	3	6	70
Date:	7/9/2007	to	7/10/2007	Effort	6	8	1.5
Species:	Largemouth bass			CPUE	1	1	47
Total number:	79						
Total weight:	49.50						
Length range:	2.3	to	19.3				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	8	1	6	38	45	-
Quality	12	0	3	20	23	53
Preferred	15	0	3	5	8	13
Memorable	20	0	0	0	0	
Trophy	25	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0	1	2.85	34.5		
2.0	4	0.00	18.5	1	3.81	35.0		
2.5	10	0.01	19.0	2	3.54	35.5		
3.0	5	0.01	19.5			36.0		
3.5	1	0.01	20.0			36.5		
4.0			20.5			37.0		
4.5			21.0			37.5		
5.0			21.5			38.0		
5.5	1	0.08	22.0			38.5		
6.0	2	0.11	22.5			39.0		
6.5	3	0.11	23.0			39.5		
7.0	2	0.17	23.5			40.0		
7.5	6	0.15	24.0			40.5		
8.0	1	0.30	24.5			41.0		
8.5	7	0.35	25.0			41.5		
9.0	4	0.35	25.5			42.0		
9.5			26.0			42.5		
10.0	4	0.51	26.5			43.0		
10.5	3	0.62	27.0			43.5		
11.0	1	0.00	27.5			44.0		
11.5	2	0.89	28.0			44.5		
12.0	4	0.94	28.5			45.0		
12.5	5	1.12	29.0			45.5		
13.0	4	1.16	29.5			46.0		
13.5	1	1.28	30.0			46.5		
14.0	1	1.59	30.5			47.0		
14.5			31.0			47.5		
15.0	1	1.46	31.5			48.0		
15.5	2	1.92	32.0			48.5		
16.0	1	1.82	32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

					TN	GN	EF
Lake:	Winona						
Date:	7/9/2007	to	7/10/2007	Total #	13	60	2
Species:	Black crappie			Effort	6	8	1.5
Total number:	75			CPUE	2	8	1
Total weight:	45.98						
Length range:	4.4	to	12.0				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	5	13	51	2	66	-
Quality	8	3	18	1	22	50
Preferred	10	0	2	0	2	
Memorable	12	0	1	0	1	
Trophy	15	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0			18.5			35.0		
2.5			19.0			35.5		
3.0			19.5			36.0		
3.5			20.0			36.5		
4.0	2	0.04	20.5			37.0		
4.5	7	0.06	21.0			37.5		
5.0	2	0.08	21.5			38.0		
5.5	8	0.09	22.0			38.5		
6.0			22.5			39.0		
6.5	5	0.17	23.0			39.5		
7.0	17	0.20	23.5			40.0		
7.5	12	0.25	24.0			40.5		
8.0	13	2.52	24.5			41.0		
8.5	4	0.37	25.0			41.5		
9.0	3	0.46	25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5	1	0.86	28.0			44.5		
12.0	1	1.03	28.5			45.0		
12.5			29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0			33.5			50.0		

					TN	GN	EF
Lake:	Winona			Total #	0	19	15
Date:	7/9/2007	to	7/10/2007	Effort	6	8	1.5
Species:	White bass			CPUE	0	2	10
Total number:	34						
Total weight:	35.85						
Length range:	6.2	to	17.4				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	6	0	19	15	34	-
Quality	9	0	17	1	18	7
Preferred	12	0	17	1	18	7
Memorable	15	0	13	1	14	7
Trophy	18	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5			34.0		
1.5			18.0			34.5		
2.0			18.5			35.0		
2.5			19.0			35.5		
3.0			19.5			36.0		
3.5			20.0			36.5		
4.0			20.5			37.0		
4.5			21.0			37.5		
5.0			21.5			38.0		
5.5			22.0			38.5		
6.0	2	0.13	22.5			39.0		
6.5	2	0.16	23.0			39.5		
7.0	4	0.19	23.5			40.0		
7.5	6	0.22	24.0			40.5		
8.0	2	0.23	24.5			41.0		
8.5			25.0			41.5		
9.0			25.5			42.0		
9.5			26.0			42.5		
10.0			26.5			43.0		
10.5			27.0			43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5			45.0		
12.5	1	1.06	29.0			45.5		
13.0			29.5			46.0		
13.5			30.0			46.5		
14.0	2	1.31	30.5			47.0		
14.5	1	1.48	31.0			47.5		
15.0	3	1.74	31.5			48.0		
15.5	5	1.90	32.0			48.5		
16.0			32.5			49.0		
16.5	4	2.12	33.0			49.5		
17.0	2	2.21	33.5			50.0		

					TN	GN	EF
Lake:	Winona			Total #	0	30	0
Date:	7/9/2007	to	7/10/2007	Effort	6	8	1.5
Species:	Northern pike			CPUE	0	4	0
Total number:	30						
Total weight:	77.04						
Length range:	17.2	to	30.0				

Group	TL (in)	TN	GN	EF	TOTAL	RSD
Stock	14	0	30	0	30	-
Quality	21	0	15	0	15	
Preferred	28	0	4	0	4	
Memorable	34	0	0	0	0	
Trophy	44	0	0	0	0	

Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)	Length group (in)	#	Mean weight (lbs)
1.0			17.5	1	1.20	34.0		
1.5			18.0			34.5		
2.0			18.5	6	1.34	35.0		
2.5			19.0	2	1.41	35.5		
3.0			19.5	3	1.64	36.0		
3.5			20.0	1	0.00	36.5		
4.0			20.5	1	2.08	37.0		
4.5			21.0	1	1.85	37.5		
5.0			21.5			38.0		
5.5			22.0			38.5		
6.0			22.5			39.0		
6.5			23.0			39.5		
7.0			23.5	1	2.78	40.0		
7.5			24.0	2	2.97	40.5		
8.0			24.5	1	3.16	41.0		
8.5			25.0	2	3.17	41.5		
9.0			25.5	1	4.01	42.0		
9.5			26.0	2	3.65	42.5		
10.0			26.5			43.0		
10.5			27.0	1	3.86	43.5		
11.0			27.5			44.0		
11.5			28.0			44.5		
12.0			28.5	1	4.70	45.0		
12.5			29.0	1	5.38	45.5		
13.0			29.5	1	5.43	46.0		
13.5			30.0	1	6.04	46.5		
14.0			30.5			47.0		
14.5			31.0			47.5		
15.0			31.5			48.0		
15.5			32.0			48.5		
16.0			32.5			49.0		
16.5			33.0			49.5		
17.0	1	1.19	33.5			50.0		

Back-calculated lengths-at-age for bluegill captured at Winona Lake, Kosciusko County, Indiana in July 2007.

		Age						
Year Class	# Aged	1	2	3	4	5	6	7
2006	11	1.7						
	SD	0.2						
2005	49	2.0	3.6					
	SD	0.4	0.6					
2004	21	1.6	3.6	5.5				
	SD	0.3	0.3	0.5				
2003	27	1.6	3.6	5.5	6.8			
	SD	0.2	0.5	0.6	0.6			
2002	17	1.9	4.2	6.1	7.4	8.2		
	SD	0.4	0.7	0.9	0.7	0.5		
2001	3	2.4	5.1	7.2	7.9	8.5	8.9	
	SD	0.4	0.0	0.9	0.4	0.1	0.2	
2000	2	1.8	3.8	5.5	6.7	8.0	8.7	9.1
	SD	0.3	0.0	0.3	0.4	0.1	0.1	0.1
Mean*		1.9	4.0	6.1	7.4	8.4	8.9	
SD		0.3	0.4	0.7	0.6	0.3	0.2	

*Does not include age groups with less than three samples.

Age-length key for bluegill captured at Winona Lake, Kosciusko County, Indiana in July 2007.

Length Group	# in sample	# (age) in subsample	Age						
			1	2	3	4	5	6	7
2.0	14	1(1)	14						
2.5	55	4(1)	55						
3.0	45	6(1)	45						
3.5	13	3(2)		13					
4.0	48	10(2)		48					
4.5	96	10(2)		96					
5.0	71	12(2)		71					
5.5	40	10(2)		40					
6.0	23	3(2), 3(3), 3(4)		8	8	7			
6.5	27	1(2), 11(3), 2(4)		2	21	4			
7.0	26	5(3), 8(4), 1(5)			9	15	2		
7.5	18	2(3), 10(4)			3	15			
8.0	12	3(4), 7(5)				4	8		
8.5	9	1(4), 6(5), 1(6)				1	7	1	
9.0	8	3(5), 2(6), 1(7)					4	3	1
9.5	2	1(7)							2
Mean TL			2.9	4.9	6.8	7.3	8.5	9.1	9.6
SE			0.03	0.04	0.06	0.09	0.12	0.14	0.16

Back-calculated lengths-at-age for yellow perch captured at Winona Lake, Kosciusko County, Indiana in July 2007.

		Age		
Year Class	# Aged	1	2	3
2006	37	2.7		
	SD	0.3		
2005	25	3.4	4.6	
	SD	0.5	0.6	
2004	16	3.3	4.8	6.5
	SD	0.4	0.6	0.9
Mean*		3.2	4.7	6.5
SD		0.4	0.6	0.9

*Does not include age groups with less than three samples.

Age-length key for yellow perch captured at Winona Lake, Kosciusko County, Indiana in July 2007.

Length	# in	# (age) in	Age		
Group	sample	subsample	1	2	3
1.5	10	2			
2.0	2	2			
2.5	3				
3.0	125	9(1)	125		
3.5	197	10(1)	197		
4.0	50	10(1)	50		
4.5	12	6(1), 1(2)	10	2	
5.0	9	2(1), 6(2)	2	7	
5.5	7	5(2), 1(3)		6	1
6.0	13	8(2), 1(3)		12	1
6.5	11	4(2), 4(3)		5	6
7.0	6	1(2), 3(3)		2	4
7.5	6	5(3)			6
8.0	3	1(3)			3
8.5					
9.0	1	1(3)			1
Mean TL			3.7	6.0	7.3
SE			0.02	0.11	0.17

Back-calculated lengths-at-age for walleye captured at Winona Lake, Kosciusko County, Indiana in July 2007.

		Age						
Year Class	# Aged	1	2	3	4	5	6	7
2006	27	7.4						
	SD	0.8						
2005	21	8.5	12.1					
	SD	0.8	1.2					
2004	7	8.4	10.9	13.6				
	SD	1.1	1.1	0.8				
2003	6	7.4	10.9	14.5	16.2			
	SD	0.8	0.7	0.5	0.5			
2002	8	8.8	12.7	15.6	17.6	18.5		
	SD	1.2	0.6	1.1	0.9	0.8		
2001	4	8.7	11.6	14.5	16.5	18.4	19.2	
	SD	0.8	1.4	1.2	0.9	0.6	1.0	
2000	2	9.4	11.9	15.9	19.2	21.2	22.2	23.0
	SD	0.0	0.6	1.2	0.6	1.0	0.9	0.5
Mean*		8.2	11.7	14.6	16.8	18.4	19.2	
SD		0.9	1.0	0.9	0.8	0.7	1.0	

Age-length key for walleye captured at Winona Lake, Kosciusko County, Indiana in July 2007.

Length Group	# in sample	# (age) in subsample	Age						
			1	2	3	4	5	6	7
7.5	1	1(1)	1						
8.0	3	3(1)	3						
8.5	3	3(1)	3						
9.0	6	5(1)	6						
9.5	5	5(1)	5						
10.0	10	7(1)	10						
10.5	1	1(1)	1						
11.0	2	2(1)	2						
11.5	1	1(2)		1					
12.0									
12.5	1	1(2)		1					
13.0	2	2(2)		2					
13.5	5	5(2)		5					
14.0	3	3(2)		3					
14.5	6	5(2), 1(3)		5	1				
15.0	4	2(2), 2(3)		2	2				
15.5	5	2(2), 3(3)		2	3				
16.0	3	2(3), 1(4)			2	1			
16.5									
17.0	2	2(4)				2			
17.5	2	1(4)				2			
18.0	3	1(4), 1(5)				2	1		
18.5	4	2(5), 2(6)					2	2	
19.0	3	3(5)					3		
19.5	1	1(5)					1		
20.0	3	1(5), 2(6)					1	2	
20.5									
21.0									
21.5									
22.0									
22.5	1	1(7)							1
23.0									
23.5	1	1(7)							1
Mean TL			9.6	14.2	15.6	17.5	19.1	19.5	23.3
SE			0.2	0.2	0.2	0.3	0.2	0.4	0.5

Back-calculated lengths-at-age for largemouth bass captured at Winona Lake, Kosciusko County, Indiana in July 2007.

		Age						
Year Class	# Aged	1	2	3	4	5	6	7
2006	20	5.2						
	SD	1.1						
2005	11	2.7	8.3					
	SD	0.3	1.7					
2004	15	2.8	6.9	10.5				
	SD	0.4	1.4	2.1				
2003	4	3.2	8.1	10.6	12.3			
	SD	0.4	1.9	1.1	0.6			
2002	1	4.7	8.2	9.5	10.9	13.7		
	SD	0.0	0.0	0.0	0.0	0.0		
2001	4	3.8	7.2	10.6	14.0	17.0	19.5	
	SD	1.7	2.4	3.6	3.9	4.6	4.4	
2000	2	2.8	7.5	10.7	13.4	15.3	16.4	17.2
	SD	0.5	2.4	1.2	2.1	2.4	2.3	2.4
Mean*		3.6	7.6	10.5	13.2	17.0	19.5	
SD		0.8	1.9	2.3	2.3	4.6	4.4	

*Does not include age groups with less than three samples.

Age-length key for largemouth bass captured at Winona Lake, Kosciusko County, Indiana in July 2007.

Length	# in	# (age) in	Age						
Group	sample	subsample	1	2	3	4	5	6	7
2.0	4								
2.5	10	2							
3.0	5	1							
3.5	1								
4.0									
4.5									
5.0									
5.5	1	1(1)	1						
6.0	2	2(1)	2						
6.5	3	3(1)	3						
7.0	2	2(1)	2						
7.5	6	4(1), 1(2)	5	1					
8.0	1	1(1)	1						
8.5	7	4(1), 1(2), 2(3)	4	1	2				
9.0	4	1(1), 2(2), 1(3)	1	2	1				
9.5									
10.0	4	3(2)		4					
10.5	3	3(2)		3					
11.0	1	1(3)			1				
11.5	2	1(3)			2				
12.0	4	1(2), 3(3)		1	3				
12.5	5	4(3), 1(4)			4	1			
13.0	4	2(3), 2(4)			2	2			
13.5	1	1(3)			1				
14.0	1	1(4)				1			
14.5									
15.0	1								
15.5	2	1(5), 1(7)					1		1
16.0	1	1(6)						1	
16.5									
17.0									
17.5									
18.0	1	1(6)						1	
18.5	1	1(6)						1	
19.0	2	1(6), 1(7)						1	1
Mean TL			7.6	10.0	11.8	13.4	15.8	18.1	17.5
SE			0.2	0.3	0.4	0.3		0.7	1.8

Back-calculated lengths-at-age for black crappie captured at Winona Lake, Kosciusko County, Indiana in July 2007.

		Age			
Year Class	# Aged	1	2	3	4
2006	11	3.3			
	SD	0.6			
2005	24	3.1	6.3		
	SD	0.6	0.9		
2004	4	3.1	5.2	7.1	
	SD	0.2	0.9	2.1	
2003	1	2.5	6.0	9.0	10.9
	SD				
Mean*		3.2	5.7	7.1	
SD		0.5	0.9	2.1	

*Does not include age groups with less than three samples.

Age-length key for black crappie captured at Winona Lake, Kosciusko County, Indiana in July 2007.

Length	# in	# (age) in	Age			
Group	sample	subsample	1	2	3	4
4.0	2	2(1)	2			
4.5	7	5(1)	7			
5.0	2					
5.5	8	4(1), 1(3)	6		2	
6.0						
6.5	5	4(2), 1(3)		4	1	
7.0	17	5(2)		17		
7.5	12	5(2)		12		
8.0	13	4(2), 1(3)		10	3	
8.5	4	3(2)		4		
9.0	3	3(2)		3		
9.5						
10.0						
10.5						
11.0						
11.5	1	1(3)			1	
12.0	1	1(4)				1
Mean TL			5.1	7.8	7.9	12.3
SE			0.2	0.1	0.9	

Back-calculated lengths-at-age for northern pike captured at Winona Lake, Kosciusko County, Indiana in July 2007.

		Age				
Year Class	# Aged	1	2	3	4	5
2006	8	14.8				
	SD	1.4				
2005	11	12.6	19.3			
	SD	3.3	4.1			
2004	2	9.2	17.2	24.2		
	SD	0.3	0.3	0.2		
2003	4	14.7	22.7	25.7	27.9	
	SD	4.8	2.9	1.5	1.2	
2002	1	19.7	23.5	26.8	28.0	29.6
	SD					
Mean*		14.0	21.0	25.7	27.9	
SD		3.2	3.5	1.5	1.2	

*Does not include age groups with less than three samples.

Age-length key for northern pike captured at Winona Lake, Kosciusko County, Indiana in July 2007.

Length Group	# in sample	# (age) in subsample	Age				
			1	2	3	4	5
17.0	1	1(1)	1				
17.5	1	1(1)	1				
18.0							
18.5	6	2(1), 3(2)	2	4			
19.0	2	1(2)		2			
19.5	3	2(1)	3				
20.0	1	1(1)	1				
20.5	1	1(2)		1			
21.0	1	1(1)	1				
21.5							
22.0							
22.5							
23.0							
23.5	1	1(2)		1			
24.0	2	2(2)		2			
24.5	1	1(2)		1			
25.0	2	2(2)		2			
25.5	1	1(3)			1		
26.0	2	1(3)			2		
26.5							
27.0	1	1(4)				1	
27.5							
28.0							
28.5	1	1(4)				1	
29.0	1	1(4)				1	
29.5	1	1(5)					1
30.0	1	1(4)				1	
Mean TL			19.2	21.8	26.1	28.9	29.8
SE			0.4	0.8	0.2	0.6	